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N92-11047

Resource ALlocation Planning Helper

(RALPH)

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RALPH Background

- **Developed to plan Deep Space Network tracking, maintenance, and ground based science**
 - **12 antennas around the world**
 - **30 active users of the DSN**
 - **Weekly plans**
 - **Approximately 300 "tracks" per week**
- **Used to generate schedules up to 2 years in advance**
- **Developed within Design Team approach (close interaction)**
- **Operational Since 1987**
- **Under configuration management since 1989**

RALPH Schedule Lifecycle

10 years - 2 years	Forecasts of resource utilization Forecasts of user contention Evaluation of mission sets
2 years - 8 weeks	Generation of detailed schedules Review and conflict resolution Adaptation to changing requirements
8 weeks - real time	Implementation of schedules Reaction to spacecraft emergencies Reaction to resource outages

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DGW-2

Scheduling Approach

- Two pass scheduling
 - Probabilistic look-ahead (profile of resource usage)
 - Schedule using profile as measure of expected conflict
- Generic representation of problem
 - Actual problem described by external files (not code)
 - Three types of resources
 - Static
 - Variable
 - Depletable
 - Requirements described in terms of
 - Variable Separations
 - Variable Durations
 - Configuration dependent pre and post activity times
 - User Windows
 - Triggers (Viewperiods)

Technology Layering

Applications Level

- DSN (RALPH)
- Space Station Assembly Sequence (FAST)
- Space Station Operations Scheduling Simulation (TOMAS)
- TDRSS Scheduling Prototype

Toolkit Level

- Scheduling
- Resource Look-ahead Profiling
- Interval Algebra
- Conversion routines

Foundation Level - Tree Manipulation Base Routines (TMBR)

- Written in C (fielded on both extended-PC and VAX)
- String storage management
- Dynamic tree manipulation (prune, graft, qualify, etc.)

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DGW-4

Details

- Approximately 30,000 lines of C code (including TMBR)
- 5 - 30 minutes to generate one week schedule (MicroVAX II)
- Full Environment
 - Form-based requirements entry
 - Graphics (GKS) and text-based (Curses) schedule editors
 - Listings
 - Plots
 - Import and export facilities
 - Multi-user system

RALPH Directions

- Migrate towards more iterative rescheduling capability
- C++ version in the works
- Change operational platform to network environment
- Expand representational base
- Continue to expand base of applications

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30-MAY-1989 13:38		RESOURCE ALLOCATION PLAN		PAGE: 1	
		ACTIVITIES LISTING FOR TDRS			
		WEEK NUMBER 43 OF YEAR 1988			
ID	DAY	START	END	FACILITY	USER
ACTIVITY					
PRE	ROT	KOT	PST	CO-USER(S)	CONF
HR	MIN	HR	MIN	FLAG	FLAG
Monday October 24					
001	298	0000	-0010	KSW	STS
002	298	0000	-0015	MARW	HST
003	298	0000	-0035	MARE	HST
004	298	0000	-0040	KSE	STS
005	298	0010	-0035	KSW	LST4
006	298	0020	-0035	MAFE	HST
007	298	0035	-0105	MAFE	ERBS
008	298	0035	-0100	MAFW	SME
009	298	0040	-0105	KSE	LST5
010	298	0045	-0145	KSW	STS
011	298	0100	-0115	MAFW	LST5
012	298	0100	-0155	MARW	HST
013	298	0120	-0220	KSE	STS
014	298	0130	-0200	MARW	ERBS
015	298	0135	-0215	MARE	HST
016	298	0135	-0150	MAFE	LST4
017	298	0150	-0240	MARW	SME
018	298	0200	-0225	KSW	LST4
019	298	0215	-0245	MAFE	ERBS
020	298	0220	-0245	KSE	LST5

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